

1 **What Is Claimed Is:**

2 1. A method of producing a feed stock comprising a modified polyethylene for
3 use in a process for forming an artifact, film or coating comprising the following steps:

4 (i) selecting a polyethylene having a crystalline phase and an amorphous phase;
5 (ii) imparting partial crosslinking, long chain branching and/or oxidation to the
6 polyethylene by subjecting the polyethylene to a dose of ionizing radiation, where said dose
7 is applied (a) when the polyethylene is at a temperature where both the crystalline and
8 amorphous phases are present and (b) while the polyethylene is in an oxygen-containing
9 atmosphere; and

10 (iii) optionally adding additives to the polyethylene after irradiation.

11 2. The method of claim 1, where said polyethylene, prior to irradiation, is a high-
12 density polyethylene with a density ranging from 0.945 to 0.970 g/cm³.

13 3. The method of claim 2, where said polyethylene, prior to irradiation, has a
14 melt flow index ranging from 0.1 to 2.0 g/10 min.

15 4. The method of claim 2, where said polyethylene, prior to irradiation, has a
16 melt flow index ranging from 0.5 to 20.0 g/10 min.

17 5. The method of claim 1, where said polyethylene, prior to irradiation, is a
18 linear low density polyethylene with a density ranging from 0.870 to 0.940 g/cm³ and a melt
19 flow index ranging from 0.4 to 10.0 g/10 min.

20 6. The method of claim 1, where said polyethylene, prior to irradiation, is a
21 blend of linear low density polyethylene and high density polyethylene, where said low
22 density polyethylene has a density that ranges from 0.920 to 0.945 g/cm³ and a melt flow
23 index that ranges from 2.0 to 10.0 g/10 min., where said high density polyethylene has a
24 density that ranges from 0.945 to 0.970 g/cm³ and a melt flow index that ranges from 3.0 to
25 10.0 g/10 min, and where the ratio of linear low density polyethylene to high density
26 polyethylene ranges from 80:20 to 40:60.

27 7. The method of claim 1 where said dose ranges from 4 to 60 kGy.

28 8. The method of claim 1 where said dose ranges from 8 to 30 kGy.

29 9. The method of claim 1 where said dose is imparted throughout the
30 polyethylene such that the dose uniformity ratio ranges from 1.0 to 3.0.

1 10. The method of claim 1, where said dose is applied while the polyethylene is
2 exposed to an unmodified atmosphere.

3 11. The method of claim 1 where the gel fraction of the polyethylene, after
4 irradiation, ranges from 0.01 to 8%, by weight.

5 12. The method of claim 1 where the gel fraction of the polyethylene, after
6 irradiation, ranges from 0.75 to 6%, by weight.

7 13. The method of claim 1 where one or more additives are added to the
8 polyethylene after irradiation through a masterbatch.

9 14. The method of claim 15 where the total concentration of additives in the
10 composition after irradiation ranges from 0.01 to 0.4 weight percent.

11 15. The method of claim 15 where the only additives added to the polyethylene
12 after irradiation are antioxidants.

13 16. A feed stock composition comprising a polyethylene irradiated by the method
14 set forth in claim 1.

15 17. An artifact, at least one part of which is formed from a feed stock composition
16 comprising a polyethylene irradiated by the method set forth in claim 1.

17 18. The artifact of claim 17, where said artifact is an extruded artifact and where
18 said feed stock comprises an irradiated high density polyethylene.

19 19. The artifact of claim 18, where said artifact is an extruded pipe.

20 20. The artifact of claim 18, wherein said artifact is an extruded film.

21 21. The artifact of claim 17, where said artifact is a molded artifact made by
22 injection molding, blow molding, rotational molding or other molding methods and where
23 said feed stock comprises an irradiated high density polyethylene.

24 22. The artifact of claim 17, where said artifact is a blown film and where said
25 feedstock comprises an irradiated linear low density polyethylene.

26 23. The artifact of claim 17, where said artifact is a blown film and where said
27 feedstock comprises an irradiated blend of linear low density polyethylene and low density
28 polyethylene.

29 24. The artifact of claim 17, where said artifact is a coated polar substrate and
30 where said coating comprises an irradiated blend of linear low density polyethylene and high
31 density polyethylene.

1 25. The artifact of claim 18, where said polar substrate is a metal substrate.
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